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June 5, 1990

Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-160, License No. R-97

Attention: Document Control Desk

Gentlemen:

On behalf of the Georgia Institute of Technology, I hereby request that the Nuclear Regulatory Commission amend Facility Operating License No. R-97 so that Fast Shutdown System (FSS) experiments (described in Appendix A) may be conducted at the Georgia Tech Research Reactor. The following are the applicable portions of the Technical Specifications (TS) that will require amendment.

1. **TS SECTION 3.1.D - REACTIVITY LIMITS**

TS 3.1.d states:

> "Prior to criticality each shim-safety blade which is withdrawn above full insertion shall be positioned so that a free fall of the blade towards its full inserted position will result in a reactor scram activated by a negative period scram,"

and Table 3.1 which states (paraphrased):

> "that the period trip shall be equal to or greater than $\pm$ 10 seconds."

REQUESTED CHANGE - It is requested that permission be given to delay the actuation signal for the negative period trip by one second so that the flux as a function of time can be monitored and studied. The one second delay is requested to be in effect during the FSS experiments only.

JUSTIFICATION - The Fast Shutdown System (see Appendix A) consists of injecting He^3 into a tube located in the core in approximately 50 milliseconds. The magnitude of the reactivity insertion due to the He^3 has been calculated to be

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-1.5% $\Delta k/k$. The insertion of negative reactivity of this magnitude will cause a scram of the reactor due to the negative period scram set point (-10 sec). It is requested that the signal to scram the reactor be delayed one second so that the dynamic change in the flux due to the injection of He^3 can be measured and studied. The ability to scram the reactor with all four shim safety blades would be unaltered and unaffected. Further, the He^3 injection itself will cause reactor shutdown. Delineation of the potential consequences should the He^3 tube fail is discussed in Appendix A with the conclusion that a one second delay before initiation of the scram signal to the reactor is not a safety concern.

The one second delay logic is shown in Figure 1. Figure 2 shows how the one second delay unit is incorporated into the GTRR circuit.

2. **TS SECTION 3.4.a - LIMITATION OF EXPERIMENTS**

TS 3.4.a states:

> "The potential reactivity worth of each secured removable experiment shall be limited to 0.015 $\Delta k/k$."

REQUESTED CHANGE - It is requested that the above wording be changed to read as follows:

> "The potential reactivity worth of each secured removable experiment shall be limited to 0.0175 $\Delta k/k$ provided that the shutdown margin of the reactor relative to the cold xenon free critical condition is at least 0.0275 $\Delta k/k$ with the most reactive shim safety blade and regulating rod fully withdrawn."

JUSTIFICATION - The primary reason for changing this specification is to provide adequate margin to accommodate the reactivity insertion due to the He^3. The calculated worth of the He^3 to be injected into the reactor is -0.015 $\Delta k/k$ (see Appendix A), which is the same as the limit specified by TS 3.4.a. To permit some margin of error in the calculations, it was felt that it would be prudent to increase the permissible reactivity worth of each secured, removable experiment (FSS experiments) from 0.015 to 0.0175 $\Delta k/k$.

3. **TS SECTION 3.4.i AND 3.4.j**

TS 3.4.i. states:

"Explosive materials in excess of 25 milligrams of TNT equivalent shall not be irradiated or stored within the reactor containment building."

TS 3.4.j states:

"Explosive materials in amounts up to 25 milligrams TNT equivalent may be irradiated and stored within the containment only if they are encapsulated in such a manner to assure compliance with Specification 3.4.f in the event of detonation of the explosive material."

REQUESTED CHANGE -

TS 3.4.i be changed to read:

"Explosive materials in excess of 25 milligrams of TNT equivalent shall not be irradiated in the GTRR."

TS 3.4.j be changed to read:

"Explosive materials in excess of 25 milligrams TNT equivalent may be stored within the containment building only if they are encapsulated in such a manner to assure full compliance with 10 CFR 50, Appendix B."

JUSTIFICATION - Explosive valves will be used in the Fast Shutdown System tests to release the He^3 gas from the high pressure cylinder (~350 psia) through the tubing and into the rod located in the reactor. The explosive valves will be located inside a metal box outside of the reactor vessel adjacent to the control room. Each explosive valve contains two primer chambers consisting of 145 milligrams each of diazodinitrophenol (DDNP) explosive material. Upon firing, the products of combustion are entirely contained within the body of the valve assembly. The structural integrity of the valve body is designed to withstand the forces associated with multiple firings. All explosive valve components to be used for the tests were supplied by Conax Buffalo Corporation under their nuclear quality assurance program which meets the requirements of 10 CFR 50, Appendix B.

We appreciate the cooperation of the USNRC in the review of this license amendment request. We hope that the review process can be completed by July 31, 1990.

Sincerely,

R. A. Karam

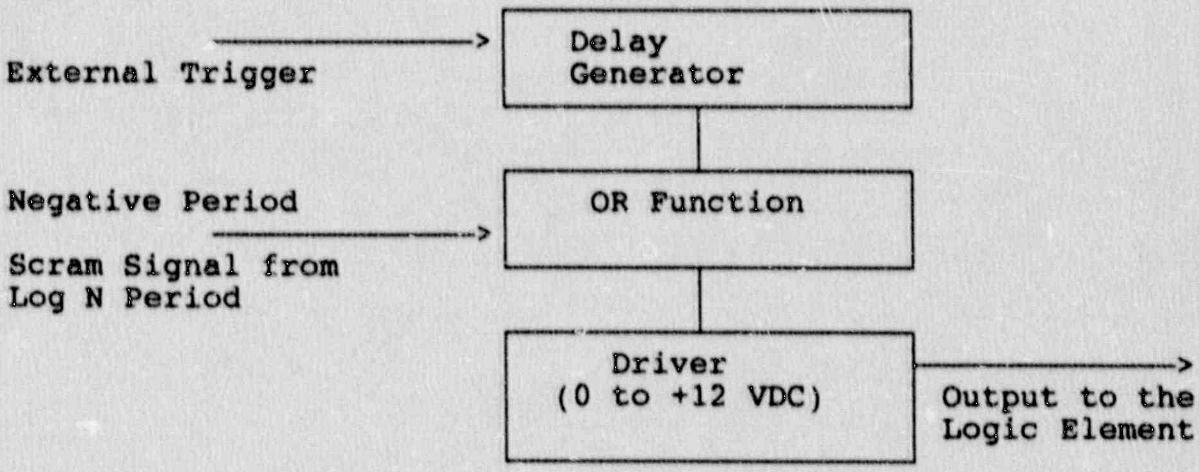
R. A. Karam, Ph.D., Director
Neely Nuclear Research Center

RAK/ccg
Attachments:
Figures 1 & 2
Modified Technical Specifications-pages 17 & 18
Appendix A

pc: Mr. A. Adams, NRC Headquarters
pc: Mr. Craig Bassett, NRC, Region II

Notary Public, DeKalb County, Georgia
My Commission Expires May 30, 1992

ONE SECOND DELAY

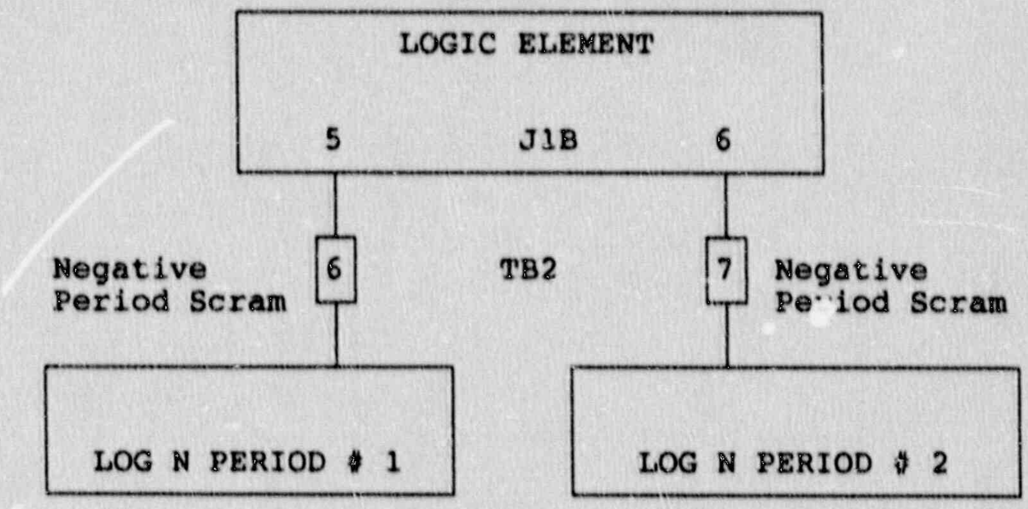


The Negative Period Scram signal is normally at +12 VDC and near ground level for scram condition. The level of the Scram signal will be sent to Logic Element except for the time the Delay Generator output in high; during that time the output to the Logic Element will be +12 VDC reguardless of the level of the Scram signal.

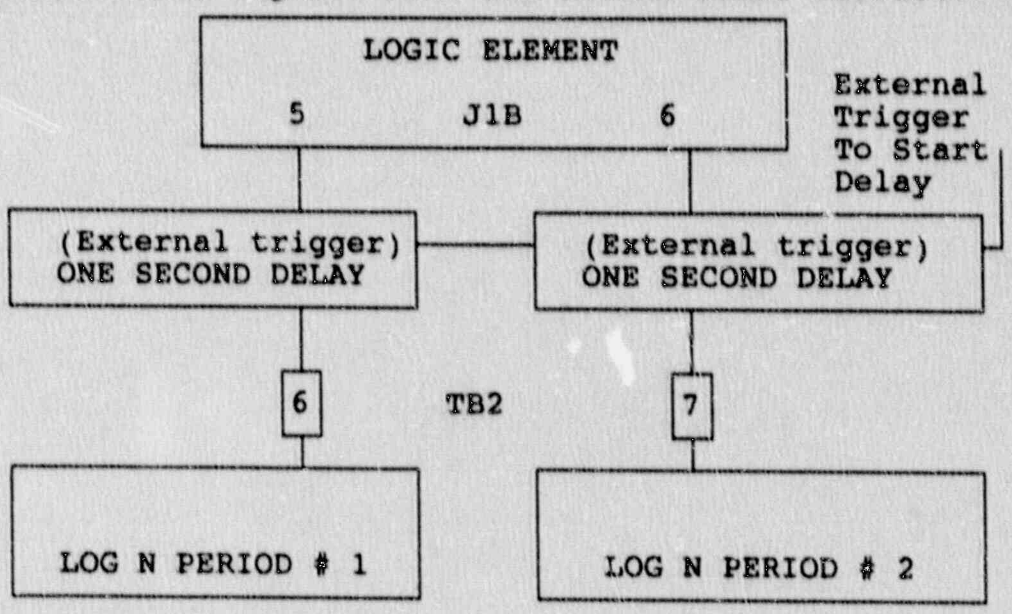
Figure 1. One Second Delay Unit

NEGATIVE PERIOD SCRAM

Negative Period Scram signals as wired:



Negative Period Scram Signals with ONE SECOND DELAY circuit:



The negative period scram signal is generated by the Log N Period Amplifier. The scram signal is +12 VDC for safe condition and near ground level for a scram condition. The One Second Delay would be activated by an external trigger and delay any negative scram by 1 second from the time of the trigger. With no trigger, the One Second Delay enables the scram signal to pass through with no delay.

Figure 2. One-second Delay Logic to be Incorporated in GTRR Circuit